

REDEFINING INSURANCE THROUGH INNOVATION: TRENDS, BENEFITS, AND REGULATORY CHALLENGES: A EUROPEAN PERSPECTIVE

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Abstract. The insurance industry, one of the oldest and most conservative sectors, is undergoing a profound transformation driven by digitalization and the integration of disruptive technologies such as artificial intelligence (AI), the Internet of Things (IoT), and blockchain. By exploring the impact of technological advancements on automation, personalization, and operational efficiency, the research highlights the benefits of adopting InsurTech solutions, including enhanced risk assessment, fraud detection, and improved client satisfaction.

At the same time, the study addresses key challenges hindering the widespread adoption of these technologies. These include regulatory constraints, data privacy concerns, and ethical implications associated with AI-driven decision-making. Furthermore, the paper underscores the necessity of transparency, fairness, and trust in the deployment of digital technologies within the insurance sector.

This research contributes to the existing body of knowledge by providing strategic insights into overcoming barriers to innovation and establishing a sustainable framework for integrating emerging technologies into insurance practices. It advocates for investments in explainable AI, ethical algorithm development, and partnerships with regulators to ensure a balanced approach between innovation and compliance. The findings underline these technologies' potential to modernize the industry and offer competitive advantages to early adopters.

By focusing on the interplay between innovation and regulation, this paper provides a roadmap for the insurance industry to thrive in the digital age and to enhance its societal impact through more inclusive and efficient insurance solutions.

Keywords: insurance; innovation; regulations; AI

Introduction

Innovation is the introduction into the use of some new or significantly improved product (good or service) or production process, a new method of marketing, or a new organizational method in commercial practice.¹ It is clear from this definition that the main feature of an innovation is that it should be implemented. Innovation can have many expressions (Vazova, Radev 2023) – learned, technical, organizational, financial, commercial action, product form, service, etc., but all of them must find practical implementation. Otherwise, they are all just an idea. The practical realization of an idea makes it an innovation only when it changes the way business is done and the way the entities that use it behave, i.e., it changes the culture, behavior, and expectations of users. The actual introduction of the innovation into the market depends on the sector for which it is intended, its willingness to accept it, its regulations, its effectiveness and the benefits that the innovation itself would bring to consumers and/or the sector. This is another characteristic of innovation, namely its transformation into a mass solution, bringing huge benefits to people and society as a whole (Krushkov, Zayakova-Krushkova 2024). The global impact and benefits turn an invention into an innovation.

Innovation is also seen as an economic phenomenon, i.e., it should always bring profit to its creator (Schumpeter 1942). According to Schumpeter's monetary theory, economic development is driven by innovation, when in a dynamic environment, old markets are destroyed and replaced by new ones – so-called 'creative destruction' (Schumpeter 1942).

An innovative invention or an innovative solution to improve a process is not an innovation if it benefits only its inventor. Yes, it is good for him that he uses it, but if another cannot use it, it is not good enough if it does not benefit another. Therefore, in our opinion, innovation should mean mass use, mass application of something new, i.e., the benefits of an innovative invention should be for a wide range of users, such as a computer, the Internet, a smartphone, etc. For something (invention, process, product, etc.) to go from being an "innovative idea" to an "innovation," it should find mass application. Innovation is the field of new thinking and turning insight into action.

The insurance industry is one of the world's oldest and most conservative industries. It has remained somewhat on the sidelines of the rapid penetration of digitalization in other sectors of the economy. However, insurance cannot remain a mechanical clock in a digital age. In recent years, digital technologies have started to enter insurance with increasing force. It has begun to transform ever faster, thanks to technological innovation and the changing expectations of insurance consumers.

This paper aims to outline the innovations and trends in insurance that are reshaping it, pointing out their benefits and the existing limitations to their wider penetration, revealing the challenges and dangers they still pose, and propose some solutions to overcome these obstacles.

The general perception is that insurance companies that proactively embrace technology and incorporate innovative and integrated platforms into their business

will be better positioned in the future and can provide personalized and high-quality products and services seamlessly to their increasingly informed and price-sensitive customers. Those who are the first to invest in digital technology will gain competitive advantages over other companies and be able to expand their insurer pools, attracting customers from other companies looking for new, easy, personalized products that save time and money. Other additional benefits that innovative solutions and technologies would bring to insurers when implemented:

- on efficient allocation of resources;
- reducing errors and operational costs;
- automation of complex processes;
- improving capital adequacy and solvency;
- better alignment of risks;
- improving signature activity through better risk assessment;
- building models for catastrophic risk management;
- faster liquidation of damage in the event of an insured event;
- more effective prevention and reduction of insurance fraud;
- improving decision-making and standardising workflow;
- exploiting emerging market opportunities;
- increasing market share.

In light of these benefits and, the rapid growth of investment in digital technology and the growing impact of technological advancements on the financial industry, many insurers have begun to actively look for ways to not be left behind. It is the partnership of insurers with various FinTech companies that have begun to play an increasingly significant role in the transformation of the insurance industry. Through the use of advanced technology, these fintech companies offer new ways to manage risk, improve customer satisfaction, and optimize insurers' operational processes or costs. This partnership trend is known as InsurTech – a combination of insurance and technology.

The role of InsurTech companies in insurance can be boiled down to:

– *Offering process automation* – InsurTech companies are developing platforms that automate the entire underwriting process – from risk assessment to claims payment. Many companies, such as Lemonade² and Hippo³ are using artificial intelligence to process claims within minutes.

– *Offering customised products* – InsurTech companies are developing software that enables the analysis of huge data sets (big data), enabling the creation of customised policies. Thus, a number of companies now offer insurance policies that are activated only when needed, for example travel insurance, or home insurance only while renting, or car insurance only while renting, etc. They develop software that processes the data collected by telematics devices during a certain period about the driver's behaviour, converting it into a factor by which the base premium is adjusted (increased or decreased), thus obtaining an individual premium depending on the driver's risk profile.

– *Innovation in distribution* – online platforms and mobile applications are being

developed to facilitate the purchase of insurance policies and interaction with customers. For example, a number of insurers provide insurance through mobile operators in emerging markets.

Technological innovation in insurance can be boiled down to the following technologies, which are being adopted by more and more insurers every year.

– **Artificial intelligence (AI)** – used for risk assessment, claims processing and custom software. Artificial intelligence software can, for example, automatically collect data from biometric sensors and medical files to get up-to-date information on customers' health and then make near-instant decisions on insurance applications and set personalized premiums based on an individual's risk profile. Many insurers use artificial intelligence-based chatbots when gathering the necessary information to underwrite insurance or when offering cross-selling.

Artificial intelligence has been successfully used to combat insurance fraud. Through machine learning algorithms and big data processing, artificial intelligence is being used to recognize unusual or suspicious patterns of behavior that may signal potential fraud. Artificial intelligence can detect recurring claims, perform data comparisons, and detect inconsistencies in submitted (declared) information or data and the location of the event, as well as detecting previously used or tampered with photos and data. Artificial intelligence is able to analyze images provided by the customer, such as photos of damage, medical documents, etc., and detect manipulated photos, fake images, or whether the damage to the vehicle corresponds to the described event.

Artificial intelligence is able to train on large databases of historical claims data and classify customers by risk profile, identifying those who would indicate a high likelihood of fraud based on past actions or identify a network of individuals involved in organized fraud. It is able to perform social network checks for connections between different individuals, photos, and other parameters. Artificial intelligence can analyze millions of claims in real time and compare new claims with historical data to detect suspicious anomalies.

The use of artificial intelligence when accepting an application for an insurance claim over the phone can allow analysis of tone, emotions, and other parameters of the voice during the conversation and identify false information.

Using Artificial Intelligence to combat insurance fraud improves efficiency, reduces costs, and increases customer confidence in the insurance industry. Insurance fraud is a serious problem that costs insurers billions of euros annually and drives up customer premiums. Ultimately, insurance fraud is borne by the insured in the insurance pool and all insureds pay its amount. Therefore, finding ways to prevent insurance fraud and reducing its number and size will reduce the cost of the insurance concerned, which is in everyone's interest – insurers and insureds. This is why many European companies such as Allianz, Zurich Insurance, AHA, and others are using artificial intelligence to detect fraud patterns in car insurance, identify suspicious claims automatically, or identify fake medical documents through text and image analysis, respectively.

For example, the English insurer Aviva⁴ uses AI to detect fraud, and in 2023 compared to 2022, it has detected 39% more insurance fraud cases, or that's more than 11,000 fraudulent claims worth more than £116 million, or on average 30 fraudulent claims per day for the sum of £318,000 per day⁵.

Explainable AI (XAI) represents a critical step toward more transparent, ethical, and reliable use of AI technologies in insurance. Unlike traditional “black boxes” in machine learning, XAI provides the ability to understand the logic behind decisions made, which is particularly important in the context of regulations and building trust among customers. The European General Data Protection Regulation (GDPR) requires a transparent explanation for automated decisions that significantly impact consumers, such as denying insurance coverage or setting insurance premiums. Article 22 of the GDPR⁶ requires companies to explain these decisions, making XAI a key compliance tool. Customers of insurance services often feel skepticism towards automated decisions, especially when they don't understand how they were made. XAI can provide a transparent explanation of the factors that influence risk assessment or claims processing, which will enhance customer confidence and satisfaction. AI models may unintentionally create bias based on age, gender, ethnicity, or other factors, which violates EU non-discrimination principles. XAI enables identifying and correcting such biases before they negatively impact customers or the insurer's reputation. Insurers should integrate XAI technologies that provide detailed information on how models arrive at certain decisions. For example, claims processing algorithms can be provided with visualizations and descriptions that explain how a case is classified as valid or potentially fraudulent. To use XAI successfully, it is necessary to invest in employee training. This includes training insurance experts and IT professionals to understand and interpret the output of XAI models so that they can communicate the results in a language that customers can understand. Companies can partner with universities and regulators to develop standard methods for explaining AI models. Such partnerships will facilitate the introduction of innovative technologies that are compliant with regulatory requirements. XAI can explain to customers how their driving style, mileage, and telematics data affect premiums, which will motivate them to change their behavior to reduce costs. When analyzing medical data and determining individual premiums, XAI can explain how certain health metrics affect calculations while protecting the privacy of sensitive data. XAI can identify suspicious patterns of behavior and provide an explanation to analysts as to why a case is considered potentially fraudulent. This will help settle claims more quickly and transparently.

– **Internet of Things (IoT)** – IoT devices that enable acquisition and monitoring, thereby improving risk assessment and management. InsurTech companies are integrating IoT devices into insurance sites, thereby enabling real-time monitoring of a range of risk factors involved in risk assessment or prevention of a covered risk. For example, telematics devices installed in cars measure driver behavior, driving style, kilometers traveled, speed, etc., thus compiling an individual profile. Software developed by InsurTech companies converts the collected data into a factor by which

the insurer's base premium is adjusted (increased or decreased), and an individual premium is obtained for the driver based on his risk profile and mileage, i.e., the person pays a premium depending on how much and how he drives (Pay-as-you-drive and Pay-how-you-drive). For example, the US insurance company Root Insurance⁷ offers policies based on individual driving behavior.

Other applications for IoT devices are in building insurance. For example, in home insurance, Hippo (www.hippo.com) offers smart smoke and carbon dioxide alarms, motion detector cameras, water and gas leak sensors, temperature sensors, etc.

IoT devices also find applications in health insurance to monitor the insured's vital signs - blood pressure, heart rate, sports activity, etc. The real-time data collected on individuals allows for the setting of individual premiums for them depending on their physical activity, as people with high sports activity and healthy lifestyles receive a discount on the insurance premium at the expense of people who lead a sedentary and unhealthy lifestyle.

– **Blockchain and Smart contracts** – this technology is based on distributed computing, which leads to a decentralized network. Blockchain is designed to avoid centralized control. It is characterized by free participation. InsurTech companies use blockchain to create smart contracts that automate the payment of benefits when predefined conditions are met. By its genesis, the use of blockchain does not allow for modifications to the insurance contract. When a certain condition in the code occurs (is met), the program automatically triggers the corresponding action. By removing the need for direct human involvement, the computer program can, in theory, automate various procedures, including claims processing. This makes the contractual insurance relationship more efficient and economical, with potentially fewer opportunities for error, misunderstanding, delay, fraud, or dispute. It removes the need to provide a set of documents when a claim is made and for the insurer's employees to receive, file, and process the claim or to make the insurance indemnity payment. The insurer saves time from having to visit the insurer's office, collect and provide documents, enter into communication with the insurer, and the insurer saves costs of settling claims (liquidation costs), thus being able to reduce the cost of insurance.

Smart contracts may find easier application in standard insurance, but there are many complex insurance products, which may be a barrier to its application. Insurance through blockchain is becoming cheaper, faster, more transparent, and more accessible while unlocking new investment opportunities, but at this stage, it remains unfeasible as yet for certain insurances.

A separate issue is that the insurance contract is in the form of an unconditionally enforceable digital code; for regulatory and legal purposes, legislation should recognise the blockchain as a legal document. In the event of litigation over an insurance policy taken out using blockchain technology, independent forensic experts capable of reading the code are needed to provide forensic technical expertise. These are problems that not only the insurance industry is going to face.

Many insurance companies now offer blockchain-based parametric smart insurance contracts, such as:

– Crop insurance – insurance companies such as *Arbol*⁸, *Etherisc*⁹, *AXA Climate*¹⁰ and others cover crop risks associated with heavy rain, drought or high temperatures (e.g. above 45 degrees for certain outdoor crops). When certain parameters of these risks are reached in a given region, as set out in the smart contracts, indemnities are automatically paid. The parameters are calibrated according to the type of crops, regions and historical data on the occurrence of risks. Based on real weather data and reaching different set thresholds, smart contracts pay different set benefits without the need to inspect the crops. This results in farmers receiving benefits quickly, saves money and gives transparency. The premium for these insurances depends on the type of crop, the region concerned and the risks covered. For example, rapeseed is insured for drought risk at a € 100 per hectare premium. The sum insured is € 1,500 per hectare. A covered event occurs, and there is 20 mm of rainfall in one month (which is 2 liters per square meter). At the end of the month, based on data from the weather station on rainfall in the given region, the threshold in the parametric insurance contract is triggered and the insured receives an automatic indemnity of €750 per hectare compensation to cover losses.

Health insurance – insurers such as *Vitality*¹¹, *Etherisc*, and *Generali* use wearable devices to track physical activity. Smart contracts adjust premiums and bonuses based on data collected, provide the latest advances in telemedicine, preventive care, and chronic disease. For example, the base is €120 per month, with the possibility of a reduction for an active lifestyle. Sum insured: €50,000 for medical expenses. If the insured reaches 10,000 steps every day for 1 month, i.e. the person maintains an active lifestyle as measured by IoT devices, the premium for the following month will be reduced by 20%.

– Parametrix IT service interruption insurance – *Parametrix Insurance*¹², for example, offers insurance that protects small and medium-sized enterprises (SMEs) from IT service interruptions. When an event occurs, such as an outage in cloud services or payment systems, the Parametric policy automatically pays compensation without the need to assess physical damage. The premium depends on the scope of coverage and the size of the business; for example, €2,500 per year. The sum insured is, for example, up to €500,000 to cover losses from business interruption. A covered insured event occurs – **a failure of** more than 5 hours in the cloud service used by the company. This time threshold triggers an automatic insurance indemnity payment of, for example, €20,000 to compensate for losses from the outage.

– Flight or train delays – for example, *Etherisc*¹³ offers similar insurance where the indemnity is paid immediately to the insurer if certain thresholds of delay of a plane or train, pre-set in the contract, are reached or if the flight itself is canceled. For example, if the flight is delayed by more than 1 hour, a compensation of 150 euros is paid, if the flight is delayed by more than 2 hours, an additional 100 euros is paid, or a total of 250 euros for the two hours, etc. They can be developed in different variants with different

thresholds and compensation amounts, the trigger being the announcement of the delay or cancellation of the flight or journey at the relevant terminal or train station.

- Carbon Offset Insurance – for example, the insurance company *Etherisc*, based on geospatial meteorological data, offers an innovative product that compensates the insured in the event of a wildfire, flood, and storm in a forested forest. It is designed for both carbon credit holders and owners of reforestation projects. The insurance is dictated by the requirements of carbon credit certifying agencies, which typically require carbon credit projects to have a minimum of 10% excess carbon offsets readily available to replace such forest losses resulting from the risks covered by the insurance.

- Professional liability insurance for IT companies for example *Colonnade Insurance*¹⁴ offers professional liability insurance designed for IT companies developing new technologies such as artificial intelligence and smart contracts.

- Parametric Earthquake Insurance – *Jumpstart Insurance*¹⁵ offers parametric earthquake insurance where the indemnity payout is automatically triggered when a certain earthquake magnitude is reached near the customer's property. The premium depends on location and risk, e.g. €500 per year. The sum insured is fixed, e.g. €50 000. An earthquake of magnitude 7.0 or higher occurs within 20 km of the property, an indemnity of €50,000 is automatically paid without the need for a damage assessment.

From what has been said so far about parametric insurance and the use of IoT devices, it can be concluded that they are the way forward towards personalized and efficient insurance services, towards offering insurance products that best meet the individual needs of the insured.

Digitalisation and new technologies such as artificial intelligence (AI), the Internet of Things (IoT), blockchain and automation are radically changing the insurance sector. The European Insurance and Occupational Pensions Authority (EIOPA) report – EIOPA-BoS-24/139 of 30 April 2024 – highlights the importance of digitalisation as well as the challenges facing the sector. The report analyses the main trends, statistics and perspectives for the future of insurance in the context of innovation. The report clearly provides comprehensive statistical information on digitalisation in the insurance sector in the European Union, revealing both the successes and the challenges facing the sector. It provides a comprehensive assessment of how digitalization is transforming insurance business models, operations, and products. It also examines the ethical, legal, and economic implications of adopting new technologies and proposes a policy framework for the sustainable development of digitalization in the sector. The report is based on a survey of 209 insurance companies from all EU Member States.

On the basis of data provided by them, it is found that in the EU insurance sector¹⁶:

- 80% of insurance companies in the EU use artificial intelligence to automate risk

assessment, claims processing, and customer segmentation. This represents an increase of 15% compared to 2020.

- Artificial intelligence is helping to reduce claims processing times by 50% by using algorithms to analyse images and data from IoT devices. For example, French insurance company AXA uses artificial intelligence to automate the processing of over 60% of claims, reducing the time it takes to pay claims to 48 hours.

- AI-based algorithms analyze data in real-time to identify suspicious patterns. This leads to a 25% reduction in insurance fraud.

- 50% of companies in Europe are using IoT devices for real-time monitoring, and these mainly cover car insurance (telematics devices monitoring driving style, allowing adaptive premiums) and health insurance – wearables¹⁷ measuring activity and health indicators.

- 20% of new products in 2023 are parametric insurance based on predefined criteria. For example, the Swiss reinsurance company Swiss Re automatically pays benefits for natural catastrophes, with over €100 million paid out in 2023 in this way

- Implementing technology saves significant money through fraud prevention and process optimization (Vazov, Kanazireva, Grynko, Krupskyi 2024). The average saving for large insurers is 5% of total costs.

- High technologies such as IoT and satellite data are used to predict and model catastrophic risks. For example, German reinsurer Munich Re is integrating AI and IoT data for flood modeling, which reduces its exposure to flood risk reinsurance by 10%.

- High technology assists insurers in managing capital requirements by improving risk assessment.

- IoT devices provide accurate data that reduces the capital required for certain risk categories.

- 65% of contracts in 2023 were signed digitally, with mobile apps and websites dominating sales. For example, German insurer Allianz reports a **25%** increase in online sales compared to the previous year 2022, thanks to investments in digital platforms.

- An important indicator in assessing the level of digitalization of the insurance sector is the revenue generated by digital distribution channels. In insurance, digital sales are mainly distributed via the companies' own website, comparison websites, social media, mobile apps or other third party websites (e.g. airline companies selling travel insurance on their website). The share of sales through digital channels as a percentage of total gross written premiums (GWP) represents on average 9% in life insurance sales and 19% in general lines of business in the European insurance sector (EIOPA Report-BoS-24/139 of 30 April 2024).

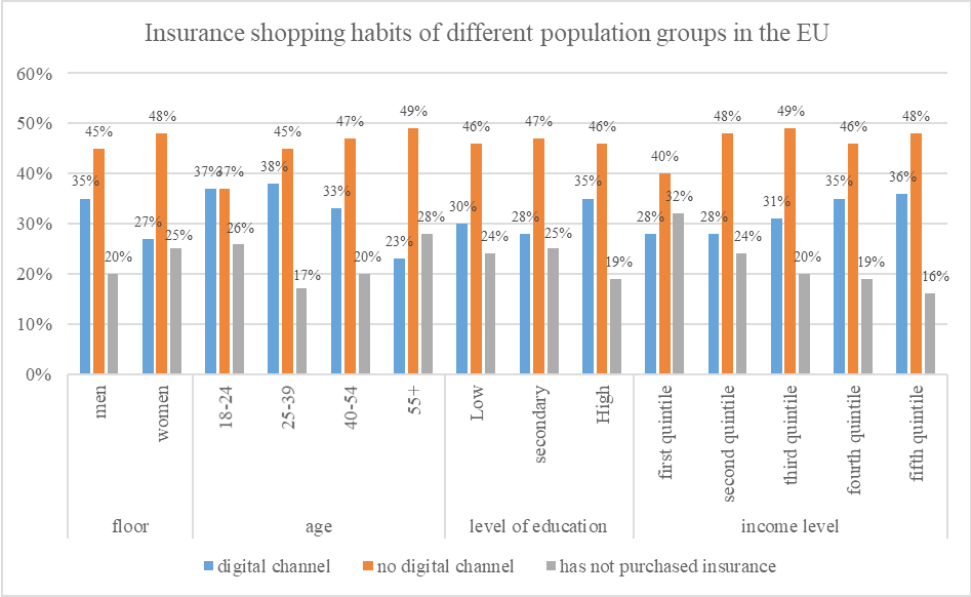
- As regards the different distribution channels for the countries, this can be seen from the data in the following table (EIOPA Report-BoS-24/139 of 30 April 2024):

IT	HR	FR	ES	EL	IE	EE	DE	DK	EN	EN	BE	EU 27	
27%	15%	23%	25%	22%	55%	47%	22%	29%	23%	10%	20%	25%	Online, from the insurance provider's website
12%	8%	7%	7%	14%	13%	20%	18%	5%	11%	4%	4%	11%	Online, via a price comparison website
4%	2%	4%	3%	5%	5%	6%	4%	2%	3%	3%	3%	4%	Online, but neither on the insurance provider's website nor on a price comparison website
40%	47%	46%	44%	27%	36%	15%	23%	33%	32%	31%	27%	34%	In person or by phone, directly from an insurance company
11%	18%	7%	15%	23%	13%	8%	15%	4%	22%	25%	15%	15%	In person or by telephone, through an intermediary (other than a bank)
9%	11%	18%	15%	11%	5%	10%	6%	7%	13%	15%	19%	11%	In person or by phone, by bank transfer
6%	5%	6%	4%	7%	3%	8%	2%	3%	5%	7%	3%	5%	The insurance came with a non-insurance product that I purchased
3%	4%	2%	3%	3%	2%	3%	3%	2%	2%	7%	3%	3%	Other distribution channels not mentioned above
13%	14%	15%	12%	15%	9%	16%	29%	29%	19%	18%	22%	19%	Not applicable (I haven't bought insurance in the last two years)
3%	4%	4%	2%	3%	2%	2%	4%	4%	4%	5%	4%	3%	I don't know / I prefer not to answer

	SE	FI	EN	SI	RO	PT	EN	AT	NL	MT	HU	LU	EN	EN	CY	
	35%	41%	17%	24%	21%	24%	30%	12%	44%	22%	21%	9%	34%	36%	16%	Online, from the insurance provider's website
	6%	6%	8%	4%	9%	4%	15%	8%	15%	2%	15%	2%	15%	17%	2%	Online, via a price comparison website
	3%	3%	4%	5%	4%	4%	5%	4%	4%	1%	3%	1%	5%	5%	1%	Online, but neither on the insurance provider's website nor on a price comparison website
	27%	30%	28%	39%	37%	32%	35%	27%	11%	50%	25%	57%	33%	17%	43%	In person or by phone, directly from an insurance company
	7%	4%	24%	35%	20%	20%	25%	33%	14%	16%	15%	16%	14%	11%	20%	In person or by telephone, through an intermediary (other than a bank)
	6%	5%	13%	8%	13%	15%	10%	11%	4%	13%	11%	12%	9%	8%	15%	In person or by phone, by bank transfer
	6%	4%	3%	5%	11%	8%	7%	4%	3%	6%	4%	5%	6%	6%	7%	The insurance came with a non-insurance product that I purchased
	3%	1%	3%	3%	4%	3%	3%	3%	1%	3%	2%	3%	3%	7%	2%	Other distribution channels not mentioned above
	27%	24%	24%	9%	15%	16%	13%	25%	25%	14%	24%	15%	12%	19%	16%	Not applicable (I haven't bought insurance in the last two years)
	7%	2%	3%	3%	2%	3%	3%	3%	3%	3%	2%	2%	5%	3%	4%	I don't know / I prefer not to answer

Source: Report on the digitalization of the European insurance sector – EIOPA Report-BoS-24/139

As is evident from the data in the table, distribution rates through different channels vary across countries due to factors such as disposable income, cultural differences, degree of digitization, varying degrees of development of distribution channels, and local legal restrictions.



Source: EIOPA’s Eurobarometer Survey, July 2023, p. 14

Note: A quintile is a type of positional average that divides a row of data into five equal parts. Dividing income among the population into five equal parts, the first quintile includes the 20% of the population with the lowest income, and the last 20% (or fifth quintile) are those with the highest income.

The data in the graph shows that as disposable income increases among the population, the number of people who do not have insurance decreases. This is natural as a person first satisfies his basic needs for food, health, overheads, and clothing and then can consider security in the form of insurance. “Typically, digital channels are preferred by young men, with high incomes and high levels of education¹⁸.

EIOPA’s 2023 Eurobarometer survey shows that 25% of EU consumers have bought at least one product from an insurance provider website – ranging from 55% in Ireland to 9% in Luxembourg, and 11% of EU consumers have bought insurance from a price comparison website while only 4% have insurance when buying online through other distribution channels.”¹⁹

A larger increase was observed in general insurance compared to life insurance. Individuals like fast service for simple, standardized products, such as travel assistance, and there they prefer to purchase it digitally, while for complex savings life insurance products and those linked to investment funds, consumers prefer personal contact with the insurer or intermediary to obtain clarification. Just over 25% of sales remain through agent networks, particularly for complex life insurance products.

According to Accenture research, *“80% of customers would switch insurers for better digital service, 71% of consumers are willing to buy insurance through digital channels, 67% would be interested in being offered insurance through their mobile devices, 48% consider product advice on social media to be ‘important’ or ‘very important’; 67% would consider buying insurance from non-insurers such as online service providers or retailers; 40% say they are likely to switch their home/car insurer in the next 12 months.”*²⁰ We can summarise that there have been changes in customer behaviour in recent years. Today’s insurance consumers are much more informed and demanding. They are looking for more transparent terms and conditions and easier access to pre-contractual information on the parameters and features of the product itself. Consumers want faster service and minimal waiting times when taking out insurance or making a claim. Their expectations are linked to insurers offering them tailored solutions to their individual and insurance protection needs. A large proportion of insurance consumers use mobile phones and expect to be offered various insurance products, specifically through apps for their mobile phones.

Many insurance consumers also use other channels to purchase insurance, such as the banking channel. In recent years, there has been an increase in insurers partnering with other industries, such as banks, to offer insurance through their channels. Such partnerships account for 10% of sales. Insurers are thus reaching a wider range of customers, reducing their costs by passing some of them on to the banks’ established channels.

We expect that in the coming years, sales of various products through digital and other channels will continue to increase and displace traditional channels, optimising costs for insurers and saving time and money for consumers.

– Annual technology investment spending is growing by 25%, with artificial intelligence (AI), the Internet of Things (IoT) and blockchain leading the way. Large insurers such as Zurich allocate up to 7% of their budgets to technology, while smaller companies invest significantly less. Around 80% of these allocations to technology investments are directed towards automation and improving the customer interface.

The introduction of Artificial Intelligence (AI), the Internet of Things (IoT), and blockchain into insurance is accompanied by a number of issues, risks, and legal and regulatory challenges. We will attempt to outline just some of these, which we consider to be key:

– The General Data Protection Regulation (GDPR) requires explicit consent for collecting and processing personal data, which complicates using AI to analyze customer information. (Article 22 of EU Regulation 2016/679) states that “the data subject has the right not to be subject to a decision based solely on automated processing, including profiling, which produces legal consequences for the data subject or similarly significantly affects him or her”, limits automated decisions that may significantly affect people’s rights, such as refusing insurance or setting premiums based on risk assessment algorithms.

– EU Regulation 2016/679 gives individuals the right to access their personal data and the right to have it corrected or deleted, which, combined with the Regulation’s requirement to only collect the minimum necessary data, limits the effectiveness of using AI-based models and their training requiring large databases. The use of blockchain technologies does not allow data to be erased, which contradicts the right of users, enshrined in the EU Regulation 2016/679, namely to have their personal data erased at their request, i.e., in other words, to be “forgotten.”

– Another legislative obstacle to the use of blockchain technology is again related to EU Regulation 2016/679 and it is in relation to the definition of “personal data controller” given in the regulation. Blockchain technology is decentralised and it is unclear who is responsible for the data, therefore we cannot define who the data controller is. Blockchain and GDPR are often in conflict because of the technology’s technical characteristics.

Blockchain-based platforms are also subject to strict monitoring due to concerns about money laundering and terrorist financing. EU regulations require identifying participants in transactions, which is very difficult when using decentralised networks such as blockchain.

– Customers have the right to an understandable explanation of decisions made by AI-based systems, which is technically difficult to provide in complex models such as neural networks.

– AI-based algorithms can be biased and create indirect discrimination based on gender, age or ethnicity, which is contrary to EU non-discrimination law. Insurers must prove that the AI systems used are fair and do not lead to discriminatory practices.

– There is still no adopted AI Regulation within the EU, and the Draft one classifies some AI systems in insurance as “high risk,” which requires:

- Strict transparency requirements.
- Conduct risk assessments prior to implementation.
- Continuous monitoring and documentation of performance
- Non-compliance with these requirements can result in high fines, expressed as a percentage of the company’s annual turnover.

– Individual EU countries have their own regulatory requirements for insurance which can make it difficult to implement unified AI solutions. For example,

in Germany and France, regulators require a much higher level of auditing and reporting for the technologies used in insurance processes than regulators in other member states do for the same technologies.

For example, the German regulator BaFin (Bundesanstalt für Finanzdienstleistungsaufsicht) requires insurers to prove that the artificial intelligence algorithms they use are fair, do not infringe consumers' rights and do not discriminate against certain groups. Separately, insurers are obliged to have clear risk management mechanisms in place when using technology based on artificial intelligence. This includes regular assessment of the impact of these technologies on consumers.

The French regulator ACPR (Autorité de Contrôle Prudentiel et de Résolution) requires AI-based technology solutions to align with local consumer protection law, meaning insurers must have detailed documentation of algorithms and decision-making mechanisms. Insurers in France need to prove that the AI solutions used are effective and can be built upon in light of future regulatory changes. In setting the insurance premium or declining to take out insurance, the French regulator requires mandatory human involvement, which means that the policy must be confirmed or declined by an employee of the insurer. In the case of sensitive personal information, particularly that used in health insurance, encryption is required to protect it.

– **Recommendations and trends for the development of the insurance sector in the context of European regulations** – The transformation of the insurance industry in the European Union is being driven by advances in digitalisation and innovation, such as artificial intelligence (AI), the Internet of Things (IoT) and blockchain technologies. However, the sector faces significant challenges stemming from regulatory and technical barriers that limit the potential of these innovations. In light of the current regulatory environment, the following are key recommendations and identified trends that can support industry development.

– The EU lacks clear and uniform standards for verifying the ethics and safety of AI algorithms in insurance. This leads to uncertainty for consumers and insurers. Creating uniform standards would reduce regulatory complexity.

– Regulations such as the Network and Information Security Directive (NIS2) (Directive (EU) 2022/2555) oblige companies, including insurers, to take more stringent measures to prevent, detect and respond to cyber security threats, including protecting AI-based systems from cyber attacks. Incorporating AI to analyse suspicious network activities can significantly reduce the risk of incidents. Regulators should provide guidance on minimum requirements for cyber security infrastructure. This includes deploying AI systems for real-time protection and training staff to operate complex digital platforms.

– With regard to smart contracts that automate insurance processes, we pointed out earlier that there are no uniform standards for their legal validity and that in the event of a legal dispute, their implementation should be suspended until it is resolved.

The draft European AI regulation, which classifies certain AI applications as “high risk”, should be complemented with practical guidelines for their implementation in the insurance sector.

- With respect to blockchain in insurance, there are no uniform technical and legal standards that put Legal Certainty on the validity of blockchain-based policies in doubt, which automatically leads to their restriction by the regulatory authorities who are strictly monitoring to protect the rights and interests of consumers.

- Finally, we would like to point out the different tax regimes in the individual member states regarding cryptocurrencies used in blockchain networks. This would create difficulties for insurers who want to use cryptocurrencies to settle payments. The inclusion of cryptocurrencies in insurance should be accompanied by requirements for traceability of transactions to prevent money laundering and terrorist financing.

All of these barriers that we have outlined to the widespread adoption of various innovative technologies in insurance can be overcome by investing in Explainable AI technologies that not only make decisions but also provide understandable, transparent, and reliable explanations to humans about the process that led to those particular decisions being made. Insurers might consider establishing ethics committees to independently audit algorithms using AI.

We believe that insurers need to take a more active role in developing European standards for artificial intelligence and increasing transparency and awareness of AI use to their customers.

These steps we have outlined, these challenges, require a balanced approach between innovation and regulatory compliance to successfully implement AI in the insurance industry. With adequate measures and flexible legislation, the EU can use innovation, and specifically in insurance, as a competitive advantage rather than as a source of obstacles. Efforts by European regulators to harmonize rules are key to accelerating the uptake of new technologies because most companies operate in different markets in EU Member States. At the same time, companies need to invest in improving cyber security and adapting to global standards.

Conclusion

The transformation of the insurance industry, driven by innovations such as artificial intelligence (AI), the Internet of Things (IoT), and blockchain technologies, represents a technological revolution and a significant step towards more efficient and personalized service. While traditionally conservative, the insurance industry faces an increasing requirement to adapt its processes, products, and business models to meet changing customer expectations and regulatory demands. One of the key trends is digitalisation, which allows insurers to automate complex processes, reduce costs and create customised products. The introduction of parametric insurance, smart contracts, and telematics technologies significantly improves risk assessment and policy management while providing faster and more transparent customer service. Data collected through IoT

devices is already changing the way insurers assess and calculate premiums, enabling the introduction of personalised models such as “pay-as-you-drive.” The integration of artificial intelligence is another leading trend. Through machine learning algorithms, insurers are not only speeding up processes, but also increasing efficiency in detecting insurance fraud by identifying suspicious patterns in huge data sets. Blockchain-based smart contracts offer automated solutions that significantly reduce operational costs and eliminate the need for human intervention in standard processes. However, the insurance industry faces significant barriers, including complex regulations, a lack of harmonized standards, and ethical challenges. GDPR limits data collection and processing capabilities, while regulatory requirements for consumer protection and cybersecurity require significant investment. Regulatory conflicts, such as the right to erasure of data and the immutability of blockchain, further complicate the deployment of new technologies. In addition to regulatory challenges, intellectual property issues are critical to the future of innovation. The need for a clear legal framework to protect algorithms, software and data is becoming increasingly necessary, especially in the context of partnerships between insurers and InsurTech companies. Without well-defined intellectual property rights, innovation is at risk of misuse and competition. In the context of the European Union, harmonisation of regulatory requirements is critical. Companies operating in multiple member states face a variety of national requirements that limit the deployment of uniform technologies and solutions. Efforts to create uniform regulatory standards will provide greater clarity and certainty for both insurers and consumers. In conclusion, the insurance industry has the potential to establish itself as a leader in the use of innovations that not only modernise the sector but also offer significant social and economic benefits. The integration of new technologies, combined with a balanced approach to regulation and intellectual property protection, will enable insurers to create a more flexible, efficient, and sustainable ecosystem. At the same time, the active involvement of regulators and industry in the creation of ethical and legal standards will ensure that these innovations meet consumer needs, strengthen trust, and contribute to the long-term development of the sector in the digital age.

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